

## **Claims**

What is claimed is:

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1. An optical oxygen laser, comprising:

a source of oxygen;

10 a cryoreactor having an input connected to the source of oxygen;

an optical pump coupled to the cryoreactor and exciting the source of oxygen to form an excited state oxygen; and

an optical resonator cavity receiving the excited state oxygen and having a laser output.

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2. The laser of claim 1, wherein the source of oxygen is a liquid oxygen.

3. The laser of claim 1, wherein the source of oxygen is a  
20 supercritical oxygen.

4. The laser of claim 1, where the source of oxygen is pressurized.

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5. The laser of claim 4, wherein a pressure of the source of oxygen is between two and ninety atmospheres.

6. The laser of claim 1, wherein the optical pump source is a diode array.

5           7. The laser of claim, 6, wherein the diode array is coupled through an optical element to an optical fiber.

8. The laser of claim 6, wherein the diode array is bathed in the source of oxygen.

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9. The laser of claim 1, wherein the cryoreactor includes an intake manifold, a waveguide and an exhaust manifold.

10. The laser of claim 10, wherein the waveguide has an  
15 optical input.

11. The laser of claim 10, further including an exhaust pipe coupled to the exhaust manifold.

20           12. The laser of claim 11, wherein a pressure in the exhaust pipe is less than a pressure of the source of oxygen.

13. A method of operating an optical oxygen laser, comprising the steps of:

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a) illuminating a volume of oxygen with an optical pump source in a reactor to form an excited state of oxygen;

b) placing the excited state of oxygen in an optical resonant cavity having a laser output; and

5 c) exhausting a decayed state of oxygen from the optical resonant cavity.

14. The method of claim 13, wherein step (a) includes the step of:

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a1) powering a ytterbium doped fiber laser.

15. The method of claim 13, wherein step (a) includes the step of:

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a1) powering a Raman fiber laser.

16. The method of claim 13, wherein step (a) further includes the step of:

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a1) cooling the optical pump with a source of oxygen.

17. An optical oxygen laser, comprising:

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an optical pump;

a reactor coupled to a source oxygen, the reactor combining a volume of oxygen from the source of oxygen with a light from the optical pump to form an excited state of oxygen; and

5 an optical resonant cavity receiving the excited state of oxygen and having a laser output.

18. The laser of claim 17, wherein the reactor has a waveguide where the light and the volume of oxygen are combined.

10 19. The laser of claim 18, wherein a pair of mirrors are placed at each end of the waveguide.

20. The laser of claim 17, wherein the optical pump includes a laser diode array.

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